silicon, wherein the at least one protective layer comprises an oxide layer, an adhesion layer, and a barrier layer; and wherein the method further comprising the steps of;

depositing the oxide layer on the silicon substrate;

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depositing the adhesion layer on the oxide layer; and

depositing the barrier layer on the adhesion layer for isolating the thin film layer.

Remarks

Claims in the application are 1-25. Claims 1 and 15 were amended in response to the rejection on the second paragraph of 35 U.S.C. 112.

Claims 1-4, 7 and 9 were rejected under 35 U.S.C. 102 (b) as being anticipated by the Henley reference. This rejection is untenable for the reason that it does not disclose a flexible substrate. The disclosure in the Henley reference at the top of col. 13 is accidental. The case of Eibel Process Co. v. Minnesota & Ontario Paper Co., 261 U.S. 45 (1923), and its progeny, stand for the proposition that accidental results or disclosure, not intended and not appreciated, do not constitute anticipation.

In the first column on p. 1 herein, it is unequivocally stated that the invention relates to a

> "... method for manufacture a functional flexible semiconductor by transferring a single-crystal semiconductor material or thin film material to a flexible substrate."

At top of col. 1, the Henley reference unequivocally states that its invention is directed to

> "... a method and device for cleaving a substrate..."

A comparison of the disclosure herein to the disclosure of the Henley reference leaves no doubt that the disclosures pertain to disparate inventions and that the disclosure of the Henley

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reference at top of col. 13 is accidental or shot gun.

Claims 5, 6 and 8 were rejected under 35 U.S.C. 103(a) as being unpatentable over the Henley reference as applied to claim 1-4, 7 and 9 and further in view of the Kub reference; claims 10-16, 18-19 and 21-25 were rejected under 35 U.S.C. 103(a) as being unpatentable over the Henley reference as applied above to claims 1-4, 7 and 9 and further in view of the Lutzen reference, the Kub reference and the Lee reference; and claim 20 was rejected under 35 U.S.C. 103(a) as being unpatentable over the Henley reference as applied to claims 1-4, 7 and 9 and further in view of the Lutzen reference, the Kub reference and the Lee reference. It is believed that all of the rejected claims are not obvious over the applied references for the reason that there is no suggestion in any of the applied references to make the proposed combinations in order to obviate the claimed subject matter.

As was already pointed out, the Henley reference is directed to cleaving of a substrate whereas here, the invention resides in transferring a functional layer onto a flexible substrate in order to derive the advantages documented herein. As noted at the middle of p.1 of the specification herein, there is interest within the art in cost-effective ways to improve the manufacture of devices having thin film functional materials and thin film single-crystal semiconductor materials bonded on a flexible substrate; a flexible substrate being a material understood to have flexibility in excess of that of silicon. Flexible substrates offer the advantages of low weight, high flexibility and relative strength.

Semiconductor devices with flexible substrates are often made by placing thin film functional materials or single layer semiconductor materials over a suitable flexible substrate. As noted at bottom of p. 1 and top of p. 2 of this specification, the thin film functional materials are

typically high temperature superconducting (YBCO), ferroelectric, piezoelectric, pyroelectric, high dielectric constant, electro-optic, photoreactive, waveguide, non-linear optical, superconducting, photodetecting, solar cell, semiconductor, wideband gap semiconductor, shaped memory alloy, electrically conducting, or have other desired qualities. As noted at top of p. 2 of this specification, there is much application within the art for single crystal semiconductor materials with flexible substrates. The thin film semiconductor material with flexible substrates can be used for such devices as flexible and low weight transmissive displays, reflective displays, emissive displays, metal tape used for shielding, smart aperture antennae, solar cells, retina prosthesis, MEMs, sensors and actuators, and flexible single-crystal semiconductor optical waveguides.

At about the middle of p. 2 of this specification, it is noted that to obtain a high quality thin film functional material, the thin layer is typically grown at a growth temperature or annealing temperature of 500-1000°C. The high growth temperature is required to assure a high quality thin film material. However, the highest temperature that a flexible substrate material can withstand is about 150°C. Therefore, it is generally not possible to obtain the best quality thin film material by growing the material directly on a flexible substrate.

The prior art solution was frought with problems, as noted on p. 2 of this specification, to wit, an optimal solution is to grow the thin film functional material on a first, or growth substrate, such as silicon, that can withstand the increased temperatures and then transfer the thin film material after it is grown to the flexible substrate. However, there have been problems with isolating and then transferring the thin film layer. If the growth substrate is etched away, mechanically lapped forced, or eliminated from the thin film layer in similar fashion, the risk of

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damage to the thin film layer during this process is considerable. Further, some growth substrate materials are very expensive, and elimination of the substrate to isolate the thin film layer is cost prohibitive. Once the thin film layer is separated from the growth substrate, there is a second problem. The thin film functional layer must have a smooth surface for the transition and bonding to the second substrate to be successful. Otherwise, the bond to the flexible substrate may not hold properly, and the device will not function optimally. Also instructive is the disclosure at bottom of p. 2 and top of p. 3 of this specification where it is noted that it is also not possible to grow a thin film layer of a single crystal semiconductor material directly on a flexible substrate. This is because there is no lattice to initiate the single crystal growth. Once again, the ideal solution is to grow a layer of the thin film single crystal material and transfer it to the flexible substrate. Like the functional material layer, the single crystal semiconductor material layer must have a smooth surface for the transition and bonding to the flexible substrate to be successful.

As was held in many cases, when prior art references require selective combinations to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gleaned from the invention itself, see, for instance, Interconnect Planning Corp., 227 U.S.P.Q. at 551. Something in the prior art as a whole must suggest the desirability, and thus, the obviousness, of making the combination, see Lindemann Maschinenfabrik GmbH v. American Hoist and Derick Co., 221 U.S.P.Q. 481, 488.

Reconsideration of the application is requested. It is believed that claims 1-25 are unobvious over the applied prior art and a notice of their allowance is requested.

It is petitioned that a one-month extension of response time be granted for this response.

Please charge our account #50-0281 with the extension fee of $110.00, or whatever is appropriate.

Attached hereto is a marked-up version of the changes made in the claims by the current amendment. The attachment is captioned "Version with markings to show changes made."

Sincerely,
George A. Kap
Reg. No. 22,898 for
John J. Karasek
Reg. No. 36,182
Associate Counsel for IP

Prepared by George A. Kap
Reg. No. 22,898
phone: 202-404-1555

CERTIFICATE OF FACSIMILE TRANSMISSION
I hereby certify that this paper is being faxed to the PTO on the date shown below.

3-17-03
Date

George A. Kap
George A. Kap

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the claims :

Claims 1 and 15 have been amended as follows:

1. (Amended) A method for making a thin film device, said method comprising the steps of:

(a) implanting hydrogen to a selected depth within a single crystal semiconducting material substrate to form a hydrogen ion layer so as to divide the single crystal substrate into two distinct portions;

(b) bonding the single crystal semiconducting material substrate to a flexible substrate; and

(c) splitting the single crystal semiconductor substrate along the implanted ion layer and removing the portion of the ~~growth~~ substrate, which is on the side of the ion layer away from the flexible substrate, wherein a remaining thin film portion is attached to the flexible substrate.

15. (Amended) A method according to claim 10, wherein the growth substrate comprising silicon, wherein the at least one protective layer comprises ~~comprising~~ an oxide layer, an adhesion layer, and a barrier layer; and wherein the method further comprising the steps of;

depositing the oxide layer on the silicon substrate;

depositing the adhesion layer on the oxide layer; and

depositing the barrier layer on the adhesion layer for isolating the thin film layer.